Feasibility of harvesting, holding and culturing *Donax spp.* for resource enhancement aquaculture

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Figure 1. Donax spp. test holding system

Objective A: Develop and document efficiency of various mass-harvesting techniques.

A total of ten *Donax* spp. harvesting tests were completed on Bogue Banks. Data collected from each of the tests was analyzed in order to find the most efficient depth and mesh size in terms of catch and bycatch. The statistical analysis is as follows:

Statistical Report

Mechanical harvesting for which the data was gathered for analysis occurred on April 11, May 24, June 8, 16, and 22, July 6,11,13,26, and 28, 2005. Every effort was made to duplicate the conditions and techniques during each harvest of *Donax* spp in order to minimize variability so that any differences that occur are a result of the different mesh sizes and/or different depths use to harvest the *Donax* spp.

A sub-sampling device called a plankton splitter was used to reduce the time needed to collect and record data. To test the reliability of this subsampling technique, subsampling data was collected and compared to the data of the entire samples. When regression was performed of the sets of data the coefficient of determination, r^2, was approximately 1 which indicates that the information contained in the subsample is nearly as good as the information contained in the entire sample.

A .05 level of significance was used for all of the following hypothesis tests.

Data from the first mechanical harvest conducted on April 11, 2005 showed that the 6 cm depth is not as effective as the 2 cm and 4 cm depths for harvesting *Donax* spp. There were no statistically significant differences in the mess sizes (3, 5, and 7 mm). However, the average volume, average weight, and average number of *Donax* spp harvested at the 4 cm depth was greater than that at the 6 cm depth (p-values of .02, .05, and .003 respectively) and no statistically significant difference between the volume of bycatch at the 4 and 6 cm depths (p-value = .80). This indicated that the 4 cm depth is better for harvesting *Donax* spp. than the 6 cm depth. It was also found that the 2 cm depth of harvest had less bycatch than the 4 cm as well as the 6 cm depth (p-values of .08 and approximately 0 respectively). Numerically, the average number of *Donax* spp harvested at the 2 cm depth (160.33) was greater than at 4 cm and 6 cm depths (54.33 and 26.67 respectively), but the standard deviation at the 2 cm depth was so large (171.34) as compared to the 4 and 6 cm depths (2.52 and 7.10 respectively), that no statistically significant difference was indicated between the average number harvested at the 2 cm depth and 4 cm depth or between the 2 cm and 6 cm depths. The conclusion reach from the data of the first mechanical harvest of *Donax* spp is that the 6 cm depth is the least effective for harvesting these clams. An average depth of 90% shell layer was taken along Bogue Banks and was found to be below 4cm. So no further *Donax* spp harvesting was performed at the 6 cm depth.

The statistical analysis of the aggregate data revealed that the average number *Donax* spp. harvested with the 3mm mesh was more than with the 7 mm mesh (p-value =

.03) and the average number of *Donax* spp harvested with the 5 mm mesh was also more than the average number harvested with the 7 mm mesh (p-value = .06). However, there was not a statistically significant difference in the number of *Donax* spp harvested with the 3 mm mesh verses the 5 mm mesh. The 3 mm mesh did harvest numerically more than the 5 mm mesh, but the standard deviations were so large (2635.92 and 1635.05 respectively) that the observed differences may be due to random chance. The 3 mm mesh does appear to harvest a greater volume of *Donax* spp than the 5 mm mesh (p-value = .14), but the data collected with the 3 mm mesh consistently has a high standard deviation; higher than that with the 5 mm mesh. No significant differences were revealed between the volumes of bycatch for any of the three mesh sizes.

There is not a significant difference in the average volume or number of *Donax* spp. harvested at the two different depths, 2 cm and 4 cm, but when using the 4 cm depth there is a significantly more bycatch than at the 2 cm depth (p-value =. 04). So there is clear evidence that the 2 cm depth is best for harvesting *Donax* spp.

As one would expect the larger mesh size, 7 mm, harvested larger *Donax* spp., than the smaller mesh sizes, 3 mm and 5 mm. In fact the p-value was approximately zero when the average size harvested with the 7 mm mesh was compared to the 3 and 5 mm mesh sizes. There was not a statistically significant difference in the average size of clams harvested with the 3 mm and 5 mm mesh sizes. A 90% confidence interval was constructed for the average lengths of the clams harvested with the three different mesh sizes. The 90% confidence intervals are (8.70 mm, 9.89 mm), (9.06 mm, 10.46 mm), and (11.82 mm, 12.76 mm) for the 3 mm, 5 mm, and 7 mm mesh sizes respectively.

In conclusion, the best method for harvesting *Donax* spp. is using the 3 mm mesh at the 2 cm depth. If one wishes more consistency in volume and number use the 5 mm mesh at the 2 cm depth. Of course if one wishes to harvest larger *Donax* spp. use the 7 mm mesh at the 2 cm depth.

Site Selection for Harvesting

Repeated efforts at harvesting *Donax spp.* for this project have resulted in learned observations about the habits of the clam and knowledge of the better sampling and harvesting sites. Use of this knowledge about *Donax* habits played an important role in locating the more densely populated aggregations on the beach. Environmental factors such as tidal movement, beach morphology, sediment size, seasonal variations, and bycatch congregations determine the "patchiness" and density of the clam aggregations. This information can be used by the harvester to increase catches on a sampling trip.

The background research of the clam biology illustrated that *Donax* thrived in sandy intertidal and subtidal areas. The sandy substrate allowed the clam to burrow quickly in order to escape predators and ride the tidal fluxes. During the harvesting tests, *Donax* spp were found mostly in sandy areas but also in very shelly regions of the beach.

Observations of *Donax* with respect to the environmental parameters proved to be an important factor when locating the clams during times of harvest testing. Clams were observed to emerge from substrates en masse immediately prior to large waves on rising tide. Then the clams would seemingly "ride" the wave up the beach. This habit leaves them exposed on a rising tide and provides evidence to the harvester of the locations of the densest aggregations. At high and low tides the *Donax* spp. were mostly congregated in areas of a shelly substrate. The clams also "ride" receding waves on a falling tide however receding waves keep clams submerged and make them difficult to spot.

Donax spp. appeared to congregate in sandy valleys in the intertidal zone that ran perpendicular to the beach. Fishing piers also seemed to attract patches of *Donax* around the pilings and several meters to either side of the piers. Dense populations of *Donax* spp. were also noticeable to either side of intertidal and subtidal pools.

The harvester uses several techniques to locate an area of densely aggregated *Donax* with minimal bycatch. One method is to disturb the substrate with the foot when it is slightly submerged and observe its composition in a receding wave. As the sediment is receding with the wave the harvester can identify conditions such as amount of shells or *Emerita*, which would be captured as bycatch or whether the area is densely populated with *Donax* spp. This is where the harvester must make a decision whether to proceed with harvesting in the area or continue looking for better sites.

We found that *Donax* clams were available throughout the year in varying amounts. During the winter months only small amounts of harvestable Donax spp. were evident along Bogue Banks. The *Donax* spp. seemed to have greater numbers in patches along the beaches during spring and fall months. In terms of overall quantities and harvestable aggregations the best results have been during the summer months.

Our observations have been that the daily migration of *Donax* spp. along with shell and Emerita consistently rotates between a heterogeneous and homogenous mixture of catch and bycatch. Clearly when harvesting the targeted species, one must find an area which holds the greatest amount of catch and the least amount of bycatch. Harvest testing to date has centered on developing best mesh and depth parameters. Future testing will attempt to harvest sufficient quantities for overwinter holding testing.

Objective B: Compare and refine feasibility of two long-term holding methods.

Developments of the *Donax* spp. test upwelling device have continued through the third quarter of the project. Preliminary tests of active and passive upwellers revealed most advantages to the passive upweller including maintenance, simplicity, and costs. The passive upweller that will be used with the *Donax* spp. holding test was designed and modified from a combination of active shellfish upweller and a McDonalds hatching jar.

The passive shellfish nursery upweller is made from an 18" cylinder with a screen bottom. The cylinder is affixed to a drain in the side of a long narrow upweller tank. Water is pumped into the upweller tank, which then flows upward through the screen and the layer of clams on the screen. Water flows upward and out the side of the cylinders through the drain which is routed through the side of the upweller tank. Active upwellers are supplied directly with pumped water and the water takes a similar route upward through a semi-fluidized bed of clams before exiting the drain.

Routine cleaning is mandatory for the inside of standard upweller designs including the upweller tanks, the inside and outside of the upweller cylinders and on both sides of the upweller screens. On our experimental Donax upweller, routine maintenance will only be required for the inside of the 4” pipe and on the 1” insert pipe as these are the only surfaces in contact with the seawater. Another purpose of this design is to reduce the frequency of maintenance, especially during the winter months when high mortality occurs with handling other species of clams.

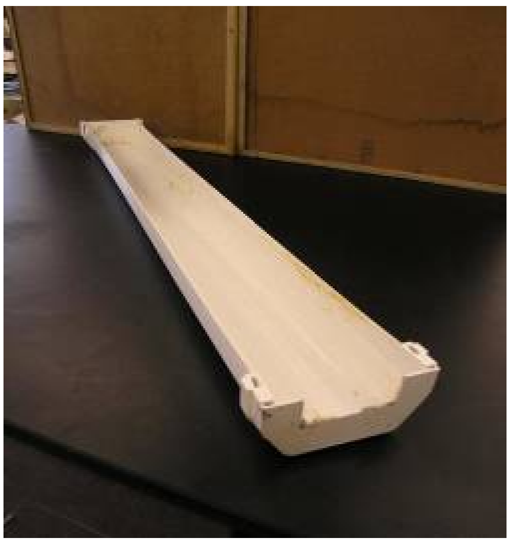


Figure 2: 1-meter Raceway

Figure 3: 18”x 4” Experimental Upweller

The construction of the Donax spp. test holding system is currently underway (Figure 1. on cover page). Figure 4. illustrates a single-flow-rate system with head tank and manifold. We will compare the success of holding *Donax* in filtered and unfiltered seawater in which one of the complete systems is shown in Figure 5. The total system will incorporate two qualities of seawater, three densities of Donax spp., three liquid flow rates, two holding devices, and three replicates of each experiment for a total of 108 holding devices.

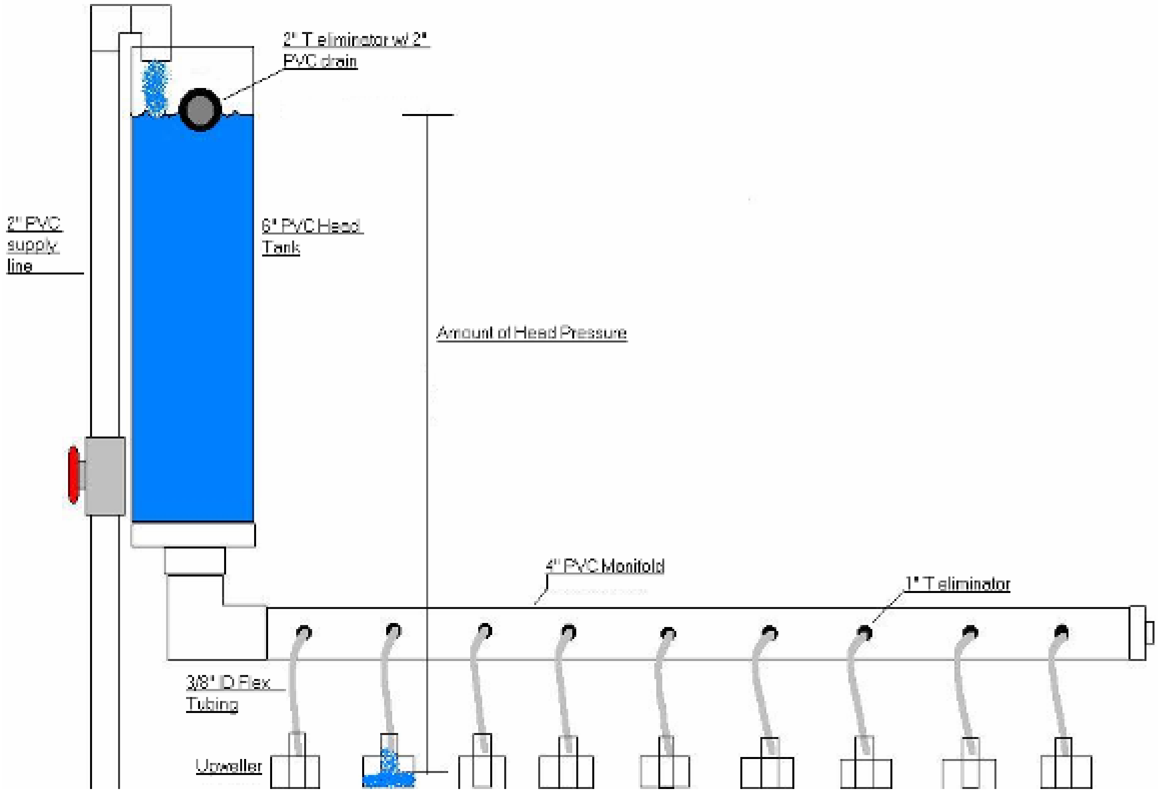


Figure 4: Side view of single flow rate *Donax* spp. holding system

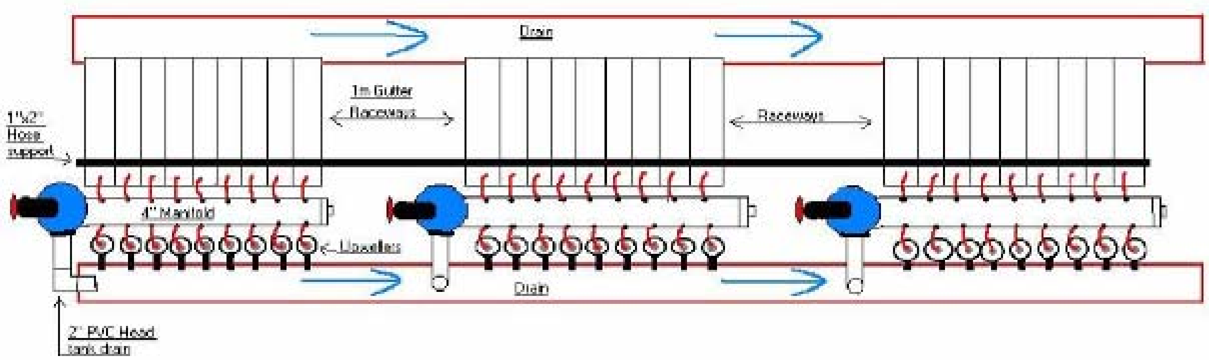
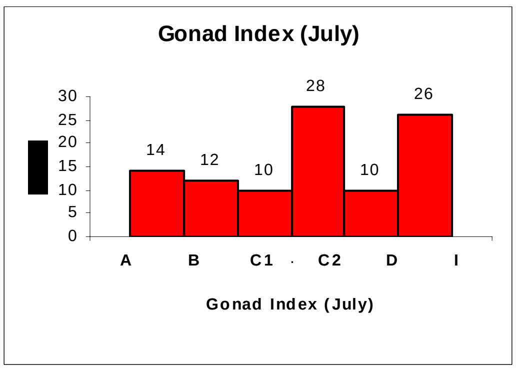
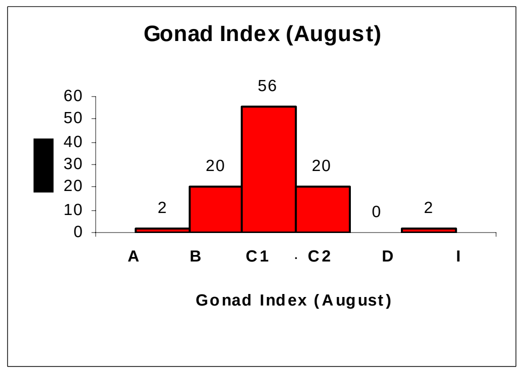


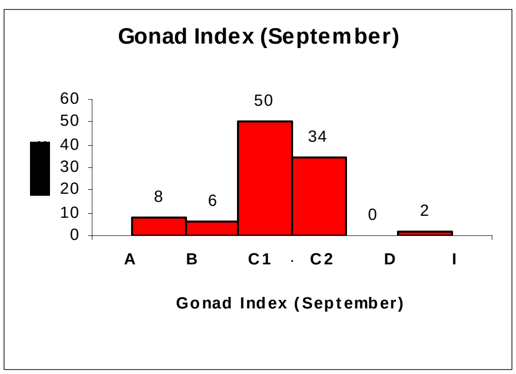
Figure 5: Overhead view of single water source *Donax* spp. raceway and upweller test system.

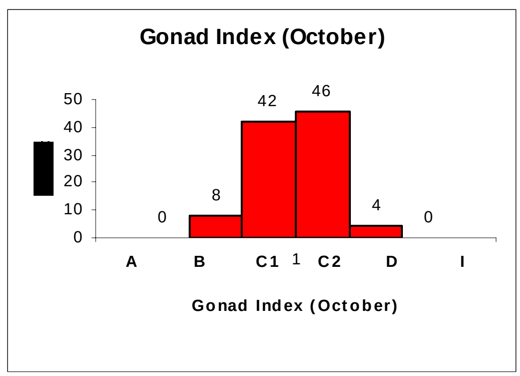
Objective C: Test and improve techniques for aquaculture propagation of *Donax*.

Monthly gonad investigations are continuing to provide information about the maturity of the *Donax* spp. clam. Examination of gonads shows that during the months of July, September and October Donax spp. are ready to spawn. The gonad investigation in August showed that over half of the tested clams are almost ready to spawn. Overall, the data for the months tested during this report gives evidence that a majority of *Donax* spp. are ready or almost ready to spawn (C2, C1). This evidence may coincide with the peak and fall of the water temperatures along Bogue Banks and may be indicative of a bimodal spawning activity.









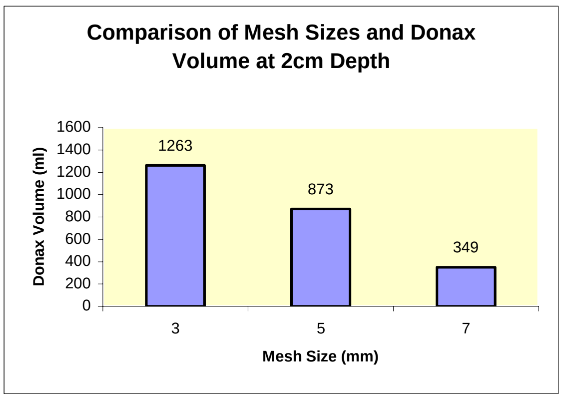
Where:
I = immature/sexes not distinguishable: no gonad seen.
A = first signs of gonad maturation; sexes start to be distinguishable
B = Gonad differentiation well advanced; sexes easily differentiated
C1 = male with spermatids; female with largely peduncul ate
C2 = male with sperm ducts; female eggs largely non-pedunculate; ready to spawn
D = gonads almost empty but sexes still distinguishable; immediately post- spawning

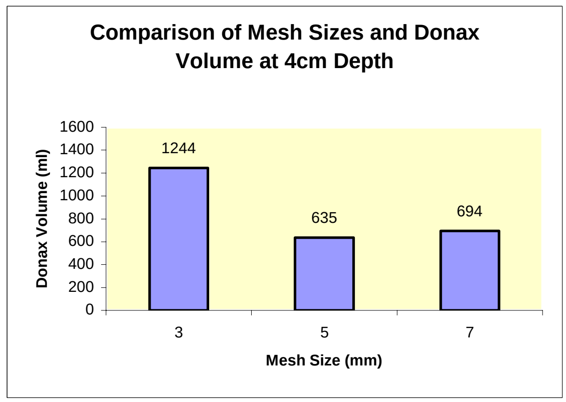
Discussion

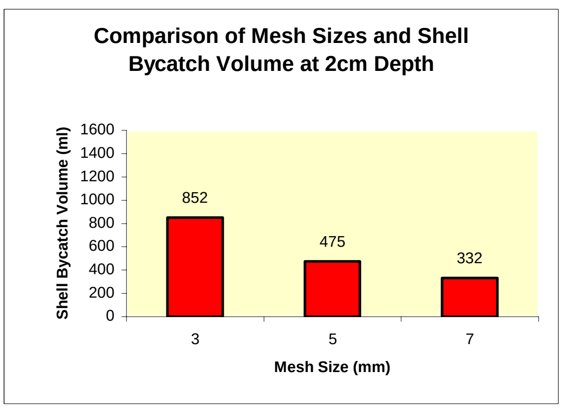
The statistical analysis of the mechanical harvest tests illustrates scientific significance that helps us determine which mesh size and depth was most efficient at catching *Donax* spp. on Bogue Banks. Important factors to be discussed with the scientific data are observations which we made in the course of undertaking the harvest

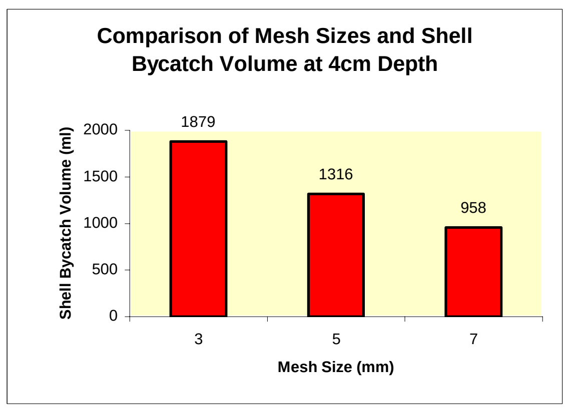
tests (see Site Selection for Harvesting, page 3). The combination of these two points should allow us to decide which technique is best for harvesting.

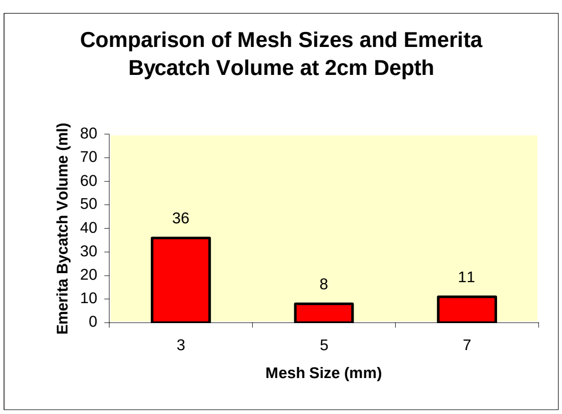
The statistical analysis revealed that there was no significant difference in the volumes of bycatch for any of the three mesh sizes. This is somewhat due to the large range and variable nature of the total quantity of catches. Yet the size of the bycatch, mostly shell material, was very different between the mesh sizes. The 3mm mesh caught very small size bycatch, which made for a timely and labor intensive separation of catch and bycatch. The 7mm mesh mostly caught large fragments of shell which allow for easy separation of catch and bycatch. Considering the amount of time and labor involved with separating the Donax spp. from the bycatch, the 7mm mesh is the most efficient. The future addition of the Kason seed sorting device could provide more efficient separation of all sizes of catch and bycatch.

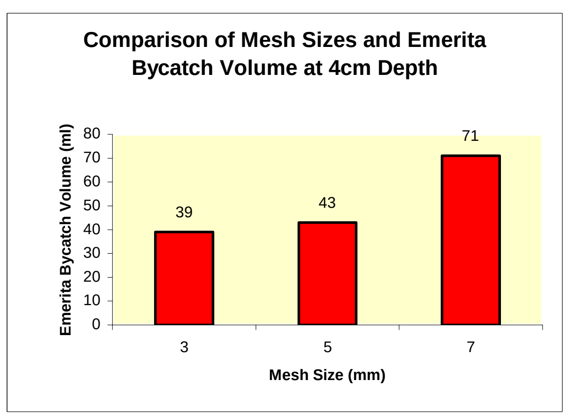












Attachment

Donax Hypothesis Tests

Mechanical Harvest Mean Comparison

Note: Subscripts 1,4,5,6,7, and A indicate the Mech Test and A being all 1-7 except 2 &3; DV is Donax Volume, BV is Bycatch Volume, DN is the number of Donax, DW is the Donax total weight, and DL is the average length of the Donax clams; M3, M5, and M7 are 3mm, 5mm, and 7mm mesh sizes respectively; d2, d4, and d6 are 2cm, 4cm, and 6cm depths of pulls respectively.

$H_o : \mu_{1DVM3} = \mu_{1DVM5}$

p-value = .48

$H_a : \mu_{1DVM3} \neq \mu_{1DVM5}$

$H_o : \mu_{1DVM3} = \mu_{1DVM7}$

p-value = .89

$H_a : \mu_{1DVM3} \neq \mu_{1DVM7}$

$H_o : \mu_{1DVM5} = \mu_{1DVM7}$

p-value = .43

$H_a : \mu_{1DVM5} \neq \mu_{1DVM7}$

$H_o : \mu_{1BVM3} = \mu_{1BVM5}$

p-value = .67

$H_a : \mu_{1BVM3} \neq \mu_{1BVM5}$

$H_o : \mu_{1BVM3} = \mu_{1BVM7}$

p-value = .49

$H_a : \mu_{1BVM3} \neq \mu_{1BVM7}$

$H_o : \mu_{1BVM5} = \mu_{1BVM7}$

p-value = .74

$H_a : \mu_{1BVM5} \neq \mu_{1BVM7}$

$H_o : \mu_{1DNM3} = \mu_{1DNM5}$

p-value = ..55

$H_a : \mu_{1DNM3} \neq \mu_{1DNM5}$

$$H_o : \mu_{1DNM3} = \mu_{1DNM7}$$
$$H_a : \mu_{1DNM3} \neq \mu_{1DNM7}$$

p-value = .43

$$H_o : \mu_{1DNM5} = \mu_{1DNM7}$$
$$H_a : \mu_{1DNM5} \neq \mu_{1DNM7}$$

p-value = .30

$$H_o : \mu_{1DWM3} = \mu_{1DWM5}$$
$$H_a : \mu_{1DWM3} \neq \mu_{1DWM5}$$

p-value = .51

$$H_o : \mu_{1DWM3} = \mu_{1DWM7}$$
$$H_a : \mu_{1DWM3} \neq \mu_{1DWM7}$$

p-value = .88

$$H_o : \mu_{1DWM5} = \mu_{1DWM7}$$
$$H_a : \mu_{1DWM5} \neq \mu_{1DWM7}$$

p-value = .59

$$H_o : \mu_{1DLM3} = \mu_{1DLM5}$$
$$H_a : \mu_{1DLM3} \neq \mu_{1DLM5}$$

p-value = .79

$$H_o : \mu_{1DLM3} = \mu_{1DLM7}$$
$$H_a : \mu_{1DLM3} \neq \mu_{1DLM7}$$

p-value = .15

$$H_o : \mu_{1DLM5} = \mu_{1DLM7}$$
$$H_a : \mu_{1DLM5} \neq \mu_{1DLM7}$$

p-value = .16

$H_o : \mu_{1DVd2} = \mu_{1DVd4}$

$H_a : \mu_{1DVd2} \neq \mu_{1DVd4}$

p-value = .55

$H_o : \mu_{1DVd2} = \mu_{1DVd6}$

$H_a : \mu_{1DVd2} \neq \mu_{1DVd6}$

p-value = .31

$H_o : \mu_{1DVd4} = \mu_{1DVd6}$

$H_a : \mu_{1DVd4} \neq \mu_{1DVd6}$

p-value = .02 (The mean volume of Donax at the 4 cm depth is greater than that at the 6 cm depth)

$H_o : \mu_{1BVd2} = \mu_{1BVd4}$

$H_a : \mu_{1BVd2} \neq \mu_{1BVd4}$

p-value = .08 (The mean volume of bycatch at the 2 cm depth is less than that at the 4 cm depth)

$H_o : \mu_{1BVd2} = \mu_{1BVd6}$

$H_a : \mu_{1BVd2} \neq \mu_{1BVd6}$

p-value ≈ 0 (The mean volume of bycatch at the 2 cm depth is less than that at the 6 cm depth)

$H_o : \mu_{1BVd4} = \mu_{1BVd6}$

$H_a : \mu_{1BVd4} = \mu_{1BVd6}$

p-value = .80

$H_o : \mu_{1DNd2} = \mu_{1DNd4}$

$H_a : \mu_{1DNd2} \neq \mu_{1DNd4}$

p-value = .40

$H_o : \mu_{1DNd2} = \mu_{1DNd6}$

p-value = .31

$H_a : \mu_{1DNd2} \neq \mu_{1DNd6}$

$H_o : \mu_{1DNd4} = \mu_{1DNd6}$

p-value = .003 (The mean number of Donax at the 4 cm depth is greater than that at the 6 cm depth)

$H_a : \mu_{1DNd4} \neq \mu_{1DNd6}$

$H_o : \mu_{1DWd2} = \mu_{1DWd4}$

p-value = .51

$H_a : \mu_{1DWd2} \neq \mu_{1DWd4}$

$H_o : \mu_{1DWd2} = \mu_{1DWd6}$

p-value = .44

$H_a : \mu_{1DWd2} \neq \mu_{1DWd6}$

$H_o : \mu_{1DWd4} = \mu_{1DWd6}$

p-value = .045 (The mean weight of Donax harvested at 4 cm is greater than that at the 6 cm depth)

$H_a : \mu_{1DWd4} \neq \mu_{1DWd6}$

$H_o : \mu_{1DLd2} = \mu_{1DLd4}$

p-value = .17

$H_a : \mu_{1DLd2} \neq \mu_{1DLd4}$

$$H_o : \mu_{1DLd2} = \mu_{1DLd6}$$

$$H_a : \mu_{1DLd2} \neq \mu_{1DLd6}$$

p-value = .15

$$H_o : \mu_{1DLd4} = \mu_{1DLd6}$$

$$H_a : \mu_{1DLd4} \neq \mu_{1DLd6}$$

p-value = .78

$$H_o : \mu_{4DVM3} = \mu_{4DVM5}$$

$$H_a : \mu_{4DVM3} \neq \mu_{4DVM5}$$

p-value = .93

$$H_o : \mu_{4DVM3} = \mu_{4DVM7}$$

$$H_a : \mu_{4DVM3} \neq \mu_{4DVM7}$$

p-value = .07 (The mean volume of Donax harvested with the 3 mm mesh is greater than that of the 7 mm mesh)

$$H_o : \mu_{4DVM5} = \mu_{4DVM7}$$

$$H_a : \mu_{4DVM5} \neq \mu_{4DVM7}$$

p-value = .096 (The mean volume of Donax harvested with the 5 mm mesh is greater than that of the 7 mm mesh)

$$H_o : \mu_{4BVM3} = \mu_{4BVM5}$$

$$H_a : \mu_{4BVM3} \neq \mu_{4BVM5}$$

p-value = .85

$$H_o : \mu_{4BVM3} = \mu_{4BVM7}$$

$$H_a : \mu_{4BVM3} \neq \mu_{4BVM7}$$

p-value = .48

$H_o : \mu_{4BVM5} = \mu_{4BVM7}$

p-value = .56

$H_a : \mu_{4BVM5} \neq \mu_{4BVM7}$

$H_o : \mu_{4DNM3} = \mu_{4DNM5}$

p-value = .62

$H_a : \mu_{4DNM3} \neq \mu_{4DNM5}$

$H_o : \mu_{4DNM3} = \mu_{4DNM7}$

p-value = .03 (The mean number of Donax harvested with

the 3mm mesh

is greater than that of the 7 mm mesh)

$H_a : \mu_{4DNM3} \neq \mu_{4DNM7}$

$H_o : \mu_{4DNM5} = \mu_{4DNM7}$

p-value = .06 (The mean number of Donax harvested with

the 5mm mesh

is greater than that of the 7 mm mesh)

$H_a : \mu_{4DNM5} \neq \mu_{4DNM7}$

$H_o : \mu_{4DWM3} = \mu_{4DWM5}$

p-value = .85

$H_a : \mu_{4DWM3} \neq \mu_{4DWM5}$

$H_o : \mu_{4DWM3} = \mu_{4DWM7}$

p-value = .09 (The mean weight of Donax harvested with

the 3mm mesh is

greater than that of the 7 mm mesh)

$H_a : \mu_{4DWM3} \neq \mu_{4DWM7}$

$$H_o : \mu_{4DWM5} = \mu_{4DWM7}$$

p-value = .11

$$H_a : \mu_{4DWM5} \neq \mu_{4DWM7}$$

$$H_o : \mu_{4DLM3} = \mu_{4DLM5}$$

p-value = .82

$$H_a : \mu_{4DLM3} \neq \mu_{4DLM5}$$

$$H_o : \mu_{4DLM3} = \mu_{4DLM7}$$

p-value = .13

$$H_a : \mu_{4DLM3} \neq \mu_{4DLM7}$$

$$H_o : \mu_{4DLM5} = \mu_{4DLM7}$$

p-value = .14

$$H_a : \mu_{4DLM5} \neq \mu_{4DLM7}$$

$$H_o : \mu_{4DVd2} = \mu_{4DVd4}$$

p-value = .39

$$H_a : \mu_{4DVd2} \neq \mu_{4DVd4}$$

$$H_o : \mu_{4BVd2} = \mu_{4BVd4}$$

p-value = .02 (The mean volume of bycatch at the 2 cm

depth is less than

that at the 4 cm depth)

$$H_a : \mu_{4BVd2} \neq \mu_{4BVd4}$$

$$H_o : \mu_{4DNd2} = \mu_{4DNd4}$$

p-value = .55

$$H_a : \mu_{4DNd2} \neq \mu_{4DNd4}$$

$$H_o : \mu_{4DWd2} = \mu_{4DWd4}$$
$$H_a : \mu_{4DWd2} \neq \mu_{4DWd4}$$

p-value = .34

$$H_o : \mu_{4DLd2} = \mu_{4DLd4}$$
$$H_a : \mu_{4DLd2} \neq \mu_{4DLd4}$$

p-value = .68

$$H_o : \mu_{5DVM3} = \mu_{5DVM5}$$
$$H_a : \mu_{5DVM3} \neq \mu_{5DVM5}$$

p-value = .87

$$H_o : \mu_{5DVM3} = \mu_{5DVM7}$$
$$H_a : \mu_{5DVM3} \neq \mu_{5DVM7}$$

p-value = .25

$$H_o : \mu_{5DVM5} = \mu_{5DVM7}$$
$$H_a : \mu_{5DVM5} \neq \mu_{5DVM7}$$

p-value = .28

$$H_o : \mu_{5BVM3} = \mu_{5BVM5}$$
$$H_a : \mu_{5BVM3} \neq \mu_{5BVM5}$$

p-value = .47

$$H_o : \mu_{5BVM3} = \mu_{5BVM7}$$
$$H_a : \mu_{5BVM3} \neq \mu_{5BVM7}$$

p-value = .48

$$H_o : \mu_{5BVM5} = \mu_{5BVM7}$$
$$H_a : \mu_{5BVM5} \neq \mu_{5BVM7}$$

p-value = .995

$$H_o : \mu_{5DNM3} = \mu_{5DNM5}$$
$$H_a : \mu_{5DNM3} \neq \mu_{5DNM5}$$

p-value = .51

$$H_o : \mu_{5DNM3} = \mu_{5DNM7}$$
$$H_a : \mu_{5DNM3} \neq \mu_{5DNM7}$$

p-value = .12

$$H_o : \mu_{5DNM5} = \mu_{5DNM7}$$
$$H_a : \mu_{5DNM5} \neq \mu_{5DNM7}$$

p-value = .24

$$H_o : \mu_{5DWM3} = \mu_{5DWM5}$$
$$H_a : \mu_{5DWM3} \neq \mu_{5DWM5}$$

p-value = .83

$$H_o : \mu_{5DWM3} = \mu_{5DWM7}$$
$$H_a : \mu_{5DWM3} \neq \mu_{5DWM7}$$

p-value = .24

$$H_o : \mu_{5DWM5} = \mu_{5DWM7}$$
$$H_a : \mu_{5DWM5} \neq \mu_{5DWM7}$$

p-value = .27

$$H_o : \mu_{5DLM3} = \mu_{5DLM5}$$
$$H_a : \mu_{5DLM3} \neq \mu_{5DLM5}$$

p-value = .15

$H_o : \mu_{5DLM3} = \mu_{5DLM7}$

p-value = .099 (The mean length of Donax harvested with the 3mm mesh is slightly less than that of the 7mm mesh)

$H_a : \mu_{5DLM3} \neq \mu_{5DLM7}$

$H_o : \mu_{5DLM5} = \mu_{5DLM7}$

p-value = .11

$H_a : \mu_{5DLM5} \neq \mu_{5DLM7}$

$H_o : \mu_{5DVd2} = \mu_{5DVd4}$

p-value = .33

$H_a : \mu_{5DVd2} \neq \mu_{5DVd4}$

$H_o : \mu_{5BVd2} = \mu_{5BVd4}$

p-value = .33

$H_a : \mu_{5BVd2} \neq \mu_{5BVd4}$

$H_o : \mu_{5DNd2} = \mu_{5DNd4}$

p-value = .49

$H_a : \mu_{5DNd2} \neq \mu_{5DNd4}$

$H_o : \mu_{5DWd2} = \mu_{5DWd4}$

p-value = .33

$H_a : \mu_{5DWd2} \neq \mu_{5DWd4}$

$H_o : \mu_{5DLd2} = \mu_{5DLd4}$

p-value = .81

$H_a : \mu_{5DLd2} \neq \mu_{5DLd4}$

$H_o : \mu_{6DVM3} = \mu_{6DVM5}$

p-value = .15

$H_a : \mu_{6DVM3} \neq \mu_{6DVM5}$

$H_o : \mu_{6DVM3} = \mu_{6DVM7}$

p-value = .20

$H_a : \mu_{6DVM3} \neq \mu_{6DVM7}$

$$H_o : \mu_{6DVM5} = \mu_{6DVM7}$$

p-value = .62

$$H_a : \mu_{6DVM5} \neq \mu_{6DVM7}$$

$$H_o : \mu_{6BVM3} = \mu_{6BVM5}$$

p-value = .81

$$H_a : \mu_{6BVM3} \neq \mu_{6BVM5}$$

$$H_o : \mu_{6BVM3} = \mu_{6BVM7}$$

p-value = .64

$$H_a : \mu_{6BVM3} \neq \mu_{6BVM7}$$

$$H_o : \mu_{6BVM5} = \mu_{6BVM7}$$

p-value = .49

$$H_a : \mu_{6BVM5} \neq \mu_{6BVM7}$$

$$H_o : \mu_{6DNM3} = \mu_{6DNM5}$$

p-value = .17

$$H_a : \mu_{6DNM3} \neq \mu_{6DNM5}$$

$$H_o : \mu_{6DNM3} = \mu_{6DNM7}$$

p-value = .13

$$H_a : \mu_{6DNM3} \neq \mu_{6DNM7}$$

$$H_o : \mu_{6DNM5} = \mu_{6DNM7}$$

p-value = .50

$$H_a : \mu_{6DNM5} \neq \mu_{6DNM7}$$

$$H_o : \mu_{6DWM3} = \mu_{6DWM5}$$

p-value = .13

$$H_a : \mu_{6DWM3} \neq \mu_{6DWM5}$$

$$H_o : \mu_{6DWM3} = \mu_{6DWM7}$$

p-value = .25

$$H_a : \mu_{6DWM3} \neq \mu_{6DWM7}$$

$H_o : \mu_{6DWM5} = \mu_{6DWM7}$

p-value = .61

$H_a : \mu_{6DWM5} \neq \mu_{6DWM7}$

$H_o : \mu_{6DLM3} = \mu_{6DLM5}$

p-value = .75

$H_a : \mu_{6DLM3} \neq \mu_{6DLM5}$

$H_o : \mu_{6DLM3} = \mu_{6DLM7}$

p-value = .045 (The mean length of Donax harvested with

the 3mm mesh

is less than that of the 7mm mesh)

$H_a : \mu_{6DLM3} \neq \mu_{6DLM7}$

$H_o : \mu_{6DLM5} = \mu_{6DLM7}$

p-value = .04 (The mean length of Donax harvested with

the 5mm mesh

is less than that of the 7mm mesh)

$H_a : \mu_{6DLM5} \neq \mu_{6DLM7}$

$H_o : \mu_{6DVd2} = \mu_{6DVd4}$

p-value = .44

$H_a : \mu_{6DVd2} \neq \mu_{6DVd4}$

$H_o : \mu_{6BVd2} = \mu_{6BVd4}$

p-value = .09 (The average volume of bycatch at the 2 cm

depth is less

than that of the 4 cm depth)

$$H_a : \mu_{6BVd2} \neq \mu_{6BVd4}$$

$$H_o : \mu_{6DNd2} = \mu_{6DNd4}$$

p-value = .40

$$H_a : \mu_{6DNd2} \neq \mu_{6DNd4}$$

$$H_o : \mu_{6DWd2} = \mu_{6DWd4}$$

p-value = .43

$$H_a : \mu_{6DWd2} \neq \mu_{6DWd4}$$

$$H_o : \mu_{6DLd2} = \mu_{6DLd4}$$

p-value = .89

$$H_a : \mu_{6DLd2} \neq \mu_{6DLd4}$$

$$H_o : \mu_{7DVM3} = \mu_{7DVM5}$$

p-value = .32

$$H_a : \mu_{7DVM3} \neq \mu_{7DVM5}$$

$$H_o : \mu_{7DVM3} = \mu_{7DVM7}$$

p-value = .65

$$H_a : \mu_{7DVM3} \neq \mu_{7DVM7}$$

$$H_o : \mu_{7DVM5} = \mu_{7DVM7}$$

p-value = .31

$$H_a : \mu_{7DVM5} \neq \mu_{7DVM7}$$

$$H_o : \mu_{7BVM3} = \mu_{7BVM5}$$

p-value = .11

$$H_a : \mu_{7BVM3} \neq \mu_{7BVM5}$$

$H_o : \mu_{7BVM3} = \mu_{7BVM7}$

p-value = .17

$H_a : \mu_{7BVM3} \neq \mu_{7BVM7}$

$H_o : \mu_{7BVM5} = \mu_{7BVM7}$

p-value = .87

$H_a : \mu_{7BVM5} \neq \mu_{7BVM7}$

$H_o : \mu_{7DNM3} = \mu_{7DNM5}$

p-value = .77

$H_a : \mu_{7DNM3} \neq \mu_{7DNM5}$

$H_o : \mu_{7DNM3} = \mu_{7DNM7}$

p-value = .34

$H_a : \mu_{7DNM3} \neq \mu_{7DNM7}$

$H_o : \mu_{7DNM5} = \mu_{7DNM7}$

p-value = .16

$H_a : \mu_{7DNM5} \neq \mu_{7DNM7}$

$H_o : \mu_{7DWM3} = \mu_{7DWM5}$

p-value = .24

$H_a : \mu_{7DWM3} \neq \mu_{7DWM5}$

$H_o : \mu_{7DWM3} = \mu_{7DWM7}$

p-value = .50

$H_a : \mu_{7DWM3} \neq \mu_{7DWM7}$

$H_o : \mu_{7DWM5} = \mu_{7DWM7}$

p-value = .30

$H_a : \mu_{7DWM5} \neq \mu_{7DWM7}$

$H_o : \mu_{7DLM3} = \mu_{7DLM5}$

p-value = .49

$H_a : \mu_{7DLM3} \neq \mu_{7DLM5}$

$H_o : \mu_{7DLM3} = \mu_{7DLM7}$

p-value = .17

$H_a : \mu_{7DLM3} \neq \mu_{7DLM7}$

$H_o : \mu_{7DLM5} = \mu_{7DLM7}$

p-value = .15

$H_a : \mu_{7DLM5} \neq \mu_{7DLM7}$

$H_o : \mu_{7DVd2} = \mu_{7DVd4}$

p-value = .22

$H_a : \mu_{7DVd2} \neq \mu_{7DVd4}$

$H_o : \mu_{7BVd2} = \mu_{7BVd4}$

p-value = .58

$H_a : \mu_{7BVd2} \neq \mu_{7BVd4}$

$H_o : \mu_{7DNd2} = \mu_{7DNd4}$

p-value = .16

$H_a : \mu_{7DNd2} \neq \mu_{7DNd4}$

$$H_o : \mu_{7DWd2} = \mu_{7DWd4}$$

p-value = .18

$$H_a : \mu_{7DWd2} \neq \mu_{7DWd4}$$

$$H_o : \mu_{7DLd2} = \mu_{7DLd4}$$

p-value = .58

$$H_a : \mu_{7DLd2} \neq \mu_{7DLd4}$$

$$H_o : \mu_{8DVM3} = \mu_{8DVM5}$$

p-value = .71

$$H_a : \mu_{8DVM3} \neq \mu_{8DVM5}$$

$$H_o : \mu_{8DVM3} = \mu_{8DVM7}$$

p-value = .54

$$H_a : \mu_{8DVM3} \neq \mu_{8DVM7}$$

$$H_o : \mu_{8DVM5} = \mu_{8DVM7}$$

p-value = .79

$$H_a : \mu_{8DVM5} \neq \mu_{8DVM7}$$

$$H_o : \mu_{8BVM3} = \mu_{8BVM5}$$

p-value = .55

$$H_a : \mu_{8BVM3} \neq \mu_{8BVM5}$$

$$H_o : \mu_{8BVM3} = \mu_{8BVM7}$$

p-value = .75

$$H_a : \mu_{8BVM3} \neq \mu_{8BVM7}$$

$$H_o : \mu_{8BVM5} = \mu_{8BVM7}$$

p-value = .54

$$H_a : \mu_{8BVM5} \neq \mu_{8BVM7}$$

$$H_o : \mu_{8DNM3} = \mu_{8DNM5}$$

p-value = .57

$H_a : \mu_{8DNM3} \neq \mu_{8DNM5}$

$H_o : \mu_{8DNM3} = \mu_{8DNM7}$

p-value = .34

$H_a : \mu_{8DNM3} \neq \mu_{8DNM7}$

$H_o : \mu_{8DNM5} = \mu_{8DNM7}$

p-value = .56

$H_a : \mu_{8DNM5} \neq \mu_{8DNM7}$

$H_o : \mu_{8DWM3} = \mu_{8DWM5}$

p-value = .73

$H_a : \mu_{8DWM3} \neq \mu_{8DWM5}$

$H_o : \mu_{8DWM3} = \mu_{8DWM7}$

p-value = .57

$H_a : \mu_{8DWM3} \neq \mu_{8DWM7}$

$H_o : \mu_{8DWM5} = \mu_{8DWM7}$

p-value = .81

$H_a : \mu_{8DWM5} \neq \mu_{8DWM7}$

$H_o : \mu_{8DLM3} = \mu_{8DLM5}$

p-value = .39

$H_a : \mu_{8DLM3} \neq \mu_{8DLM5}$

$H_o : \mu_{8DLM3} = \mu_{8DLM7}$

p-value = .03 (The mean length of Donax harvested with the 3 mm mesh is less then that of the 7 mm mesh)

$H_a : \mu_{8DLM3} \neq \mu_{1DLM7}$

$H_o : \mu_{8DLM5} = \mu_{8DLM7}$

p-value = .06 (The mean length of Donax harvested with the 5 mm mesh is less then that of the 7 mm mesh)

$H_a : \mu_{8DLM5} \neq \mu_{8DLM7}$

$H_o : \mu_{8DVd2} = \mu_{8DVd4}$

p-value = .02 (The mean volume of Donax harvested at 2 cm is less than that at the 4 cm depth)

$H_a : \mu_{8DVd2} \neq \mu_{8DVd4}$

$H_o : \mu_{8BVd2} = \mu_{8BVd4}$

p-value = .87

$H_a : \mu_{8BVd2} \neq \mu_{8BVd4}$

$H_o : \mu_{8DNd2} = \mu_{8DNd4}$

p-value = .097 (The mean number of Donax harvested at 2 cm is less than that at the 4 cm depth)

$H_a : \mu_{8DNd2} \neq \mu_{8DNd4}$

$H_o : \mu_{8DWd2} = \mu_{8DWd4}$

p-value = .01 (The mean weight of Donax harvested at 2 cm is less than that at the 4 cm depth)

$H_a : \mu_{8DWd2} \neq \mu_{8DWd4}$

$H_o : \mu_{8DLd2} = \mu_{8DLd4}$

p-value = .55

$H_a : \mu_{8DLd2} \neq \mu_{8DLd4}$

$H_o : \mu_{9DVM3} = \mu_{9DVM5}$

p-value = .83

$H_a : \mu_{9DVM3} \neq \mu_{9DVM5}$

$$H_o : \mu_{9DVM3} = \mu_{9DVM7}$$

$$H_a : \mu_{9DVM3} \neq \mu_{9DVM7}$$

p-value = .42

$$H_o : \mu_{9DVM5} = \mu_{9DVM7}$$

$$H_a : \mu_{9DVM5} \neq \mu_{9DVM7}$$

p-value = .09 (The mean volume of Donax harvested with the 5 mm mesh is greater than that of the 7 mm mesh)

$$H_o : \mu_{9BVM3} = \mu_{9BVM5}$$

$$H_a : \mu_{9BVM3} \neq \mu_{9BVM5}$$

p-value = .40

$$H_o : \mu_{9BVM3} = \mu_{9BVM7}$$

$$H_a : \mu_{9BVM3} \neq \mu_{9BVM7}$$

p-value = .53

$$H_o : \mu_{9BVM5} = \mu_{9BVM7}$$

$$H_a : \mu_{9BVM5} \neq \mu_{9BVM7}$$

p-value = .70

$$H_o : \mu_{9DNM3} = \mu_{9DNM5}$$

$$H_a : \mu_{9DNM3} \neq \mu_{9DNM5}$$

p-value = .99

$$H_o : \mu_{9DNM3} = \mu_{9DNM7}$$

$$H_a : \mu_{9DNM3} \neq \mu_{9DNM7}$$

p-value = .22

$$H_o : \mu_{9DNM5} = \mu_{9DNM7}$$

$$H_a : \mu_{9DNM5} \neq \mu_{9DNM7}$$

p-value = .05 (The mean number of Donax harvested with the 5 mm mesh is greater than that with the 7 mm mesh)

$H_o : \mu_{9DWM3} = \mu_{9DWM5}$

p-value = .90

$H_a : \mu_{9DWM3} \neq \mu_{9DWM5}$

$H_o : \mu_{9DWM3} = \mu_{9DWM7}$

p-value = .43

$H_a : \mu_{9DWM3} \neq \mu_{9DWM7}$

$H_o : \mu_{9DWM5} = \mu_{9DWM7}$

p-value = .06 (The mean weight of Donax harvested with

the 5 mm mesh

is greater than that with the 7 mm mesh)

$H_a : \mu_{9DWM5} \neq \mu_{9DWM7}$

$H_o : \mu_{9DLM3} = \mu_{9DLM5}$

p-value = .92

$H_a : \mu_{9DLM3} \neq \mu_{9DLM5}$

$H_o : \mu_{9DLM3} = \mu_{9DLM7}$

p-value = .11

$H_a : \mu_{9DLM3} \neq \mu_{9DLM7}$

$H_o : \mu_{9DLM5} = \mu_{9DLM7}$

p-value = .104

$H_a : \mu_{9DLM5} \neq \mu_{9DLM7}$

$H_o : \mu_{9DVd2} = \mu_{9DVd4}$

p-value = .22

$H_a : \mu_{9DVd2} \neq \mu_{9DVd4}$

$H_o : \mu_{9BVd2} = \mu_{9BVd4}$

p-value = .17

$H_a : \mu_{9BVd2} \neq \mu_{9BVd4}$

$H_o : \mu_{9DNd2} = \mu_{9DNd4}$

p-value = .32

$H_a : \mu_{9DNd2} \neq \mu_{9DNd4}$

$H_o : \mu_{9DWd2} = \mu_{9DWd4}$

p-value = .32

$H_a : \mu_{9DWd2} \neq \mu_{9DWd4}$

$H_o : \mu_{9DLd2} = \mu_{9DLd4}$

p-value = .79

$H_a : \mu_{9DLd2} \neq \mu_{9DLd4}$

$H_o : \mu_{10DVM3} = \mu_{10DVM5}$

p-value = .40

$H_a : \mu_{10DVM3} \neq \mu_{10DVM5}$

$H_o : \mu_{10DVM3} = \mu_{10DVM7}$

p-value = .93

$H_a : \mu_{10DVM3} \neq \mu_{10DVM7}$

$H_o : \mu_{10DVM5} = \mu_{10DVM7}$

p-value = .22

$H_a : \mu_{10DVM5} \neq \mu_{10DVM7}$

$H_o : \mu_{10BVM3} = \mu_{10BVM5}$

p-value = .82

$H_a : \mu_{10BVM3} \neq \mu_{10BVM5}$

$H_o : \mu_{10BVM3} = \mu_{10BVM7}$

p-value = .47

$H_a : \mu_{10BVM3} \neq \mu_{10BVM7}$

$H_o : \mu_{10BVM5} = \mu_{10BVM7}$

p-value = .54

$H_a : \mu_{10BVM5} \neq \mu_{10BVM7}$

$H_o : \mu_{10DNM3} = \mu_{10DNM5}$

p-value = .36

$H_a : \mu_{10DNM3} \neq \mu_{10DNM5}$

$H_o : \mu_{10DNM3} = \mu_{10DNM7}$

p-value = .28

$H_a : \mu_{10DNM3} \neq \mu_{10DNM7}$

$H_o : \mu_{10DNM5} = \mu_{10DNM7}$

p-value = .05 (The mean number of Donax harvested with the 5 mm mesh is greater than that with the 7 mm mesh)

$H_a : \mu_{10DNM5} \neq \mu_{10DNM7}$

$H_o : \mu_{10DWM3} = \mu_{10DWM5}$

p-value = .46

$H_a : \mu_{10DWM3} \neq \mu_{10DWM5}$

$H_o : \mu_{10DWM3} = \mu_{10DWM7}$

p-value = .30

$H_a : \mu_{10DWM3} \neq \mu_{10DWM7}$

$H_o : \mu_{10DWM5} = \mu_{10DWM7}$

p-value = .78

$H_a : \mu_{10DWM5} \neq \mu_{10DWM7}$

$H_o : \mu_{10DLM3} = \mu_{10DLM5}$

p-value = .29

$H_a : \mu_{10DLM3} \neq \mu_{10DLM5}$

$H_o : \mu_{10DLM3} = \mu_{10DLM7}$

p-value = .13

$H_a : \mu_{10DLM3} \neq \mu_{10DLM7}$

$H_o : \mu_{10DLM5} = \mu_{10DLM7}$

p-value = .33

$H_a : \mu_{10DLM5} \neq \mu_{10DLM7}$

$H_o : \mu_{10DVd2} = \mu_{10DVd4}$

p-value = .73

$H_a : \mu_{10DVd2} \neq \mu_{10DVd4}$

$H_o : \mu_{10BVd2} = \mu_{10BVd4}$

p-value = .05 (The mean volume of bycatch at the 2 cm depth is less than that at the 4 cm depth)

$H_a : \mu_{10BVd2} \neq \mu_{10BVd4}$

$H_o : \mu_{10DNd2} = \mu_{10DNd4}$

p-value = .72

$H_a : \mu_{10DNd2} \neq \mu_{10DNd4}$

$H_o : \mu_{10DWd2} = \mu_{10DWd4}$

p-value = .63

$H_a : \mu_{10DWd2} \neq \mu_{10DWd4}$

$H_o : \mu_{10DLd2} = \mu_{10DLd4}$

p-value = .93

$H_a : \mu_{10DLd2} \neq \mu_{10DLd4}$

$H_o : \mu_{11DVM3} = \mu_{11DVM5}$

p-value = .58

$H_a : \mu_{11DVM3} \neq \mu_{11DVM5}$

$H_o : \mu_{11DVM3} = \mu_{11DVM7}$

p-value = .74

$H_a : \mu_{11DVM3} \neq \mu_{11DVM7}$

$H_o : \mu_{11DVM5} = \mu_{11DVM7}$

p-value = .83

$H_a : \mu_{11DVM5} \neq \mu_{11DVM7}$

$H_o : \mu_{11BVM3} = \mu_{11BVM5}$

p-value = .50

$H_a : \mu_{11BVM3} \neq \mu_{11BVM5}$

$H_o : \mu_{11BVM3} = \mu_{11BVM7}$

p-value = .42

$H_a : \mu_{11BVM3} \neq \mu_{11BVM7}$

$$H_o : \mu_{11BVM5} = \mu_{11BVM7}$$

p-value = .34

$$H_a : \mu_{11BVM5} \neq \mu_{11BVM7}$$

$$H_o : \mu_{11DNM3} = \mu_{11DNM5}$$

p-value = .53

$$H_a : \mu_{11DNM3} \neq \mu_{11DNM5}$$

$$H_o : \mu_{11DNM3} = \mu_{11DNM7}$$

p-value = .40

$$H_a : \mu_{11DNM3} \neq \mu_{11DNM7}$$

$$H_o : \mu_{11DNM5} = \mu_{11DNM7}$$

p-value = .45

$$H_a : \mu_{11DNM5} \neq \mu_{11DNM7}$$

$$H_o : \mu_{11DWM3} = \mu_{11DWM5}$$

p-value = .55

$$H_a : \mu_{11DWM3} \neq \mu_{11DWM5}$$

$$H_o : \mu_{11DWM3} = \mu_{11DWM7}$$

p-value = .76

$$H_a : \mu_{11DWM3} \neq \mu_{11DWM7}$$

$$H_o : \mu_{11DWM5} = \mu_{11DWM7}$$

p-value = .72

$$H_a : \mu_{11DWM5} \neq \mu_{11DWM7}$$

No average length data for Mechanical Harvest 11

$$H_o : \mu_{11DVd2} = \mu_{11DVd4}$$

$$H_a : \mu_{11DVd2} \neq \mu_{11DVd4}$$

p-value = .01 (The mean volume of Donax harvested at the 2 cm depth is less than that at the 4 cm depth)

$$H_o : \mu_{11BVd2} = \mu_{11BVd4}$$

$$H_a : \mu_{11BVd2} \neq \mu_{11BVd4}$$

p-value = .54

$$H_o : \mu_{11DNd2} = \mu_{11DNd4}$$

$$H_a : \mu_{11DNd2} \neq \mu_{11DNd4}$$

p-value = .22

$$H_o : \mu_{11DWd2} = \mu_{11DWd4}$$

$$H_a : \mu_{11DWd2} \neq \mu_{11DWd4}$$

p-value = .02 (The mean weight of Donax harvested at the 2 cm depth is less that that at the 4 cm depth)

No average length data for Mechanical Harvest Test 11

$$H_o : \mu_{12DVM3} = \mu_{12DVM5}$$

$$H_a : \mu_{12DVM3} \neq \mu_{12DVM5}$$

p-value = .78

$$H_o : \mu_{12DVM3} = \mu_{12DVM7}$$

p-value = .95

$$H_a : \mu_{12DVM3} \neq \mu_{12DVM7}$$

$$H_o : \mu_{12DVM5} = \mu_{12DVM7}$$

p-value = .77

$$H_a : \mu_{12DVM5} \neq \mu_{12DVM7}$$

$$H_o : \mu_{12BVM3} = \mu_{12BVM5}$$

p-value = .55

$$H_a : \mu_{12BVM3} \neq \mu_{12BVM5}$$

$$H_o : \mu_{12BVM3} = \mu_{12BVM7}$$

p-value = .08 (The mean volume of bycatch harvested with

the 3 mm mesh

is greater than that with the 7 mm mesh)

$$H_a : \mu_{12BVM3} \neq \mu_{12BVM7}$$

$$H_o : \mu_{12BVM5} = \mu_{12BVM7}$$

p-value = .24

$$H_a : \mu_{12BVM5} \neq \mu_{12BVM7}$$

$$H_o : \mu_{12DNM3} = \mu_{12DNM5}$$

p-value = .57

$$H_a : \mu_{12DNM3} \neq \mu_{12DNM5}$$

$$H_o : \mu_{12DNM3} = \mu_{12DNM7}$$

p-value = .30

$H_a : \mu_{12DNM3} \neq \mu_{12DNM7}$

$H_o : \mu_{12DNM5} = \mu_{12DNM7}$

p-value = .89

$H_a : \mu_{12DNM5} \neq \mu_{12DNM7}$

$H_o : \mu_{12DWM3} = \mu_{12DWM5}$

p-value = .56

$H_a : \mu_{12DWM3} \neq \mu_{12DWM5}$

$H_o : \mu_{12DWM3} = \mu_{12DWM7}$

p-value = .85

$H_a : \mu_{12DWM3} \neq \mu_{12DWM7}$

$H_o : \mu_{12DWM5} = \mu_{12DWM7}$

p-value = .61

$H_a : \mu_{12DWM5} \neq \mu_{12DWM7}$

$H_o : \mu_{12DLM3} = \mu_{12DLM5}$

p-value = .16

$H_a : \mu_{12DLM3} \neq \mu_{12DLM5}$

$H_o : \mu_{12DLM3} = \mu_{12DLM7}$

p-value = .06 (The mean length of Donax harvested with the 3 mm mesh is less than that with the 7 mm mesh)

$H_a : \mu_{12DLM3} \neq \mu_{12DLM7}$

$H_o : \mu_{12DLM5} = \mu_{12DLM7}$

p-value = .14

$H_a : \mu_{12DLM5} \neq \mu_{12DLM7}$

$H_o : \mu_{12DVd2} = \mu_{12DVd4}$

p-value = .06 (The mean volume of Donax harvested at the

2 cm depth is

less than that at the 4 cm depth)

$H_a : \mu_{12DVd2} \neq \mu_{12DVd4}$

$H_o : \mu_{12BVd2} = \mu_{12BVd4}$

p-value = .39

$H_a : \mu_{12BVd2} \neq \mu_{12BVd4}$

$H_o : \mu_{12DNd2} = \mu_{12DNd4}$

p-value = .11

$H_a : \mu_{12DNd2} \neq \mu_{12DNd4}$

$H_o : \mu_{12DWd2} = \mu_{12DWd4}$

p-value = .09 (The mean weight of Donax harvested at the

2 cm depth is

less than that at the 4 cm depth)

$H_a : \mu_{12DWd2} \neq \mu_{12DWd4}$

$H_o : \mu_{12DLd2} = \mu_{12DLd4}$

p-value = .99

$H_a : \mu_{12DLd2} \neq \mu_{12DLd4}$

$$H_o : \mu_{ADVM3} = \mu_{ADVM5}$$

p-value = .32

$$H_a : \mu_{ADVM3} \neq \mu_{ADVM5}$$

$$H_o : \mu_{ADVM3} = \mu_{ADVM7}$$

p-value = .14

$$H_a : \mu_{ADVM3} \neq \mu_{ADVM7}$$

$$H_o : \mu_{ADVM5} = \mu_{ADVM7}$$

p-value = .45

$$H_a : \mu_{ADVM5} \neq \mu_{ADVM7}$$

$$H_o : \mu_{ABVM3} = \mu_{ABVM5}$$

p-value = .44

$$H_a : \mu_{ABVM3} \neq \mu_{ABVM5}$$

$$H_o : \mu_{ABVM3} = \mu_{ABVM7}$$

p-value = .20

$$H_a : \mu_{ABVM3} \neq \mu_{ABVM7}$$

$$H_o : \mu_{ABVM5} = \mu_{ABVM7}$$

p-value = .55

$$H_a : \mu_{ABVM5} \neq \mu_{ABVM7}$$

$$H_o : \mu_{ADNM3} = \mu_{ADNM5}$$

p-value = .36

$$H_a : \mu_{ADNM3} \neq \mu_{ADNM5}$$

$$H_o : \mu_{ADNM3} = \mu_{ADNM7}$$

$$H_a : \mu_{ADNM3} \neq \mu_{ADNM7}$$

p-value = .03 (The mean number of Donax harvested with the 3mm mesh is greater than that of the 7mm mesh)

$$H_o : \mu_{ADNM5} = \mu_{ADNM7}$$

$$H_a : \mu_{ADNM5} \neq \mu_{ADNM7}$$

p-value = .06 (The mean number of Donax harvested with the 5mm mesh is greater than that of the 7mm mesh)

$$H_o : \mu_{ADWM3} = \mu_{ADWM5}$$

$$H_a : \mu_{ADWM3} \neq \mu_{ADWM5}$$

p-value = .33

$$H_o : \mu_{ADWM3} = \mu_{ADWM7}$$

$$H_a : \mu_{ADWM3} \neq \mu_{ADWM7}$$

p-value = .16

$$H_o : \mu_{ADWM5} = \mu_{ADWM7}$$

$$H_a : \mu_{ADWM5} \neq \mu_{ADWM7}$$

p-value = .52

$$H_o : \mu_{ADLM3} = \mu_{ADLM5}$$

$$H_a : \mu_{ADLM3} \neq \mu_{ADLM5}$$

p-value = .38

$$H_o : \mu_{ADLM3} = \mu_{ADLM7}$$

$$H_a : \mu_{ADLM3} \neq \mu_{ADLM7}$$

p-value ≈ 0 (The mean length of Donax harvested with the 3mm mesh is less than that for the 7mm mesh)

$$H_o : \mu_{ADLM5} = \mu_{ADLM7}$$

$$H_a : \mu_{ADLM5} \neq \mu_{ADLM7}$$

p-value ≈ 0 (The mean length of Donax harvested with the 5mm mesh is less than that for the 7mm mesh)

$$H_o : \mu_{ADVd2} = \mu_{ADVd4}$$

$$H_a : \mu_{ADVd2} \neq \mu_{ADVd4}$$

p-value = .94

$$H_o : \mu_{ABVd2} = \mu_{ABVd4}$$

$$H_a : \mu_{ABVd2} \neq \mu_{ABVd4}$$

p-value = .04 (The mean volume of bycatch harvested at the 2cm depth is less than that for the 4cm depth)

$$H_o : \mu_{ADNd2} = \mu_{ADNd4}$$

$$H_a : \mu_{ADNd2} \neq \mu_{ADNd4}$$

p-value = .91

$$H_o : \mu_{ADWd2} = \mu_{ADWd4}$$

$$H_a : \mu_{ADWd2} \neq \mu_{ADWd4}$$

p-value = .93

$$H_o : \mu_{ADLd2} = \mu_{ADLd4}$$

$$H_a : \mu_{ADLd2} \neq \mu_{ADLd4}$$

p-value = .27